

CLAIMS

1. An optical film for a liquid crystal display laminated a polarizing plate and a retardation film so that an absorption axis of the polarizing plate and a slow axis of the retardation film are perpendicular or parallel to each other,

wherein the polarizing plate comprises a transparent protective film on both surfaces of a complex type scattering-dichroic absorbing polarizer including a film that has a structure having a minute domain dispersed in a matrix formed of an optically-transparent water-soluble resin including an absorbing dichroic material, and

the transparent protective film satisfies that an in-plane retardation $Re_1 = (nx_1 - ny_1) \times d_1$ is 10 nm or less and

a thickness direction retardation $R_{th} = \{(nx_1 + ny_1)/2 - nz_1\} \times d_1$ is in the range of from 30 nm to 100 nm,

where a direction on the transparent protective film in which an in-plane refractive index gives maximum is defined as X axis, a direction perpendicular to X axis is defined as Y axis, a direction of the film thickness is defined as Z axis; and refractive indices at 550 nm in the respective axes directions are defined as nx_1 , ny_1 and nz_1 ; and a thickness of the film is defined as d_1 (nm); and

the retardation film satisfies that an Nz value represented by $Nz = (nx_2 - nz_2)/(nx_2 - ny_2)$ is in the range of from 0.1 to 0.8

and

an in-plane retardation $Re_2 = (nx_2 - ny_2) \times d_2$ is in the range of from 60 to 300 nm,

where a direction on the retardation film in which an in-plane refractive index gives maximum is defined as X axis, a direction perpendicular to X axis is defined as Y axis, a direction perpendicular to X axis is defined as Y axis, a direction of the film thickness is defined as Z axis; and refractive indices at 550 nm in the respective axes directions are defined as nx_2 , ny_2 and nz_2 ; and a thickness of the film is defined as d_2 (nm).

2. The optical film according to Claim 1, wherein the minute domain of the complex type absorbing polarizer is formed of an oriented birefringent material.

3. The optical film according to Claim 2, wherein the birefringent material shows liquid crystalline at least in orientation processing step.

4. The optical film according to Claim 2, wherein the minute domain of the complex type absorbing polarizer has 0.02 or more of birefringence.

5. The optical film according to Claim 2, wherein in a refractive index difference between the birefringent material forming the minute domain and the optically-transparent water-soluble resin of the complex type absorbing polarizer in each optical axis direction,

a refractive index difference (Δn^1) in direction of axis

showing a maximum is 0.03 or more, and

a refractive index difference (Δn^2) between the Δn^1 direction and a direction of axes of two directions perpendicular to the Δn^1 direction is 50% or less of the Δn^1 .

5 6. The optical film according to Claim 5, wherein an absorption axis of the absorbing dichroic material of the complex type absorbing polarizer is oriented in the Δn^1 direction.

7. The optical film according to Claim 1, wherein the film used as the complex type absorbing polarizer is manufactured by stretching.

8. The optical film according to Claim 5, wherein the minute domain of the complex type absorbing polarizer has a length of 0.05 to 500 μm in the Δn^2 direction.

9. The optical film according to Claim 1, wherein the retardation film is a stretched film made of a transparent polymer film.

10 10. The optical film according to Claim 1, wherein the complex type absorbing polarizer and the retardation film are laminated and fixed with a transparent acrylic pressure-sensitive adhesive.

11. The optical film according to Claim 1, wherein a transmittance to a linearly polarized light in a transmission direction is 80% or more,

a haze value is 30% or less , and

25 a haze value to a linearly polarized light in an absorption

direction is 30% or more, with regard to the complex type absorbing polarizer.

12. The optical film according to claim 1, applied to an IPS mode liquid crystal display comprising a liquid crystal cell
5 driven in IPS mode.

13. The optical film according to claim 12, wherein the liquid crystal cell driven in IPS mode is a liquid crystal cell in IPS mode having a retardation value in the range of from 230 to 360 nm at 550 nm when no voltage is applied.

10 14. A transmissive liquid crystal display comprising: a liquid crystal cell containing a pair of substrates between which a liquid crystal layer is sandwiched, and driven in IPS mode; and a pair of polarizing plates disposed on both sides of the liquid crystal cells so that an absorption axis of the polarizing plates
15 are perpendicular to each other,

wherein at least one of the polarizing plates is an optical film according to claim 12, and the optical film is disposed so that an retardation film side faces the liquid crystal cell.

15 15. The transmissive liquid crystal display according to claim 14,

wherein the optical film according to claim 12 is disposed on a cell substrate on the viewing side, and

an extraordinary refractive index direction of a liquid crystal material in the liquid crystal cell when no voltage is
25 applied and an absorption axis of the polarizing plate on the light

incidence side are parallel to each other.

16. The transmissive liquid crystal display according to claim 14,

wherein the optical film according to claim 12 is disposed
5 on a cell substrate on the light incidence side, and

an extraordinary index direction of a liquid crystal material in the liquid crystal cell when no voltage is applied and an absorption axis of the polarizing plate in the optical film are perpendicular to each other.

10 17. The transmissive liquid crystal display according to claim 15 or 16, wherein the optical film comprises a polarizing plate and a retardation film so that an absorption axis of the polarizing plate and a slow axis of the retardation film are perpendicular to each other.

15 18. The transmissive liquid crystal display according to claim 14,

wherein the optical film according to claim 12 is disposed on a cell substrate on the viewing side and the light incidence side, and

20 an extraordinary index direction of a liquid crystal material in the liquid crystal cell when no voltage is applied and an absorption axis of the polarizing plate in the optical film on the light incidence side are parallel to each other.

25 19. The transmissive liquid crystal display according to claim 18, wherein the optical film comprises a polarizing plate

and a retardation film so that an absorption axis of the polarizing plate and a slow axis of the retardation film are parallel to each other.

20. The transmissive liquid crystal display according to
5 claim 18 or 19, wherein an in-plane retardation Re_2 of the retardation film in the optical film disposed on the cell substrate on the light incidence side is smaller than an in-plane retardation Re_2 of the retardation film in the optical film disposed on the cell substrate on the viewing side.

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